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24 June 1999

Mr. Randy Godfrey, Engineering Manager
U.S. Department of the Army
New England District, Corps of Engineers
696 Virginia Road
Concord, MA 01742-2751

Re: Contract No. DACA31-96-D-0006
Justification for Modified Derived Concentration Guidelines
St. Albans Veterans Administration Extended Care Facility, Queens, New York
WESTON W.O. No.: 10971-219-002-0001
DCN: VAHOSP-062499-AABH

Dear Mr. Godfrey:

Enclosed please find three (3) copies of the above-referenced report. If you have any immediate questions or wish to discuss this, please do not hesitate to contact me at (847) 918-4087 or John Rhyner (516) 873-3814.

Very truly yours,

ROY F. WESTON, INC.

Michael Madonia
Senior Client Service Manager

MM/sr
Enclosure

cc: H. Honerlah, CENAB, one (1) copy of report (both volumes)
J. Rhyner, WESTON
M. Madonia, WESTON
DCN Files



**TECHNICAL SUPPORT SERVICES
ST. ALBANS VETERANS ADMINISTRATION EXTENDED CARE CENTER
QUEENS, NEW YORK**

Contract No. DACA31-D-00006

**JUSTIFICATION FOR MODIFIED DERIVED CONCENTRATION GUIDELINES
(DCGL)**

Task Order No. 19
DCN: VAHOSP-062499-AABH

24 June 1999

INTRODUCTION

This document is prepared to support the application of modified derived concentration guidelines (DCGLs) to future decontamination and decommissioning (D&D) operations at the St. Albans Veterans Administration Extended Care Center (VAECC). The VAECC currently maintains a possession-only byproduct materials license (31-02892-06) administered by the U.S. Nuclear Regulatory Commission (NRC). Radionuclide possession is limited to strontium-90 only. The VAECC Work Plan (S&W 1998) has specified surface contamination DCGLs for both building surfaces and unrestricted release of equipment that are based on NRC Regulatory Guide 1.86 (NRC 1976). The bulk material and soil release criterion contained within the VAECC Work Plan has been adopted from an unspecified reference.

The modified DCGLs (for both surfaces and soil/bulk material) discussed in this document are based on current regulatory guidance. Separate sets of surface contamination DCGLs are presented for release of building surfaces and for unrestricted release of equipment and materials from the facility. The DCGLs for the release of building surfaces are based on application of the generic screening criteria contained in the November 18, 1998 Federal Register Notice – Supplemental Information on the Implementation of the Final Rule on Radiological Criteria for License Termination (NRC 1998a). DCGLs for unrestricted release of equipment and materials from the facility are taken from Policy and Guidance Directive FC 83-23 (NRC 1993), which supersedes NRC Regulatory Guide 1.86.

The soil/bulk material DCGL was developed using recommended pathway analysis methods. It was postulated that a site-specific dose assessment prepared for the VAECC facility would indicate that the soil/bulk material criterion specified in the VAECC Work Plan was excessively restrictive, and that somewhat higher concentrations would provide adequate protection to the public. This assumption was supported given the relative locations of the contaminated areas at the VAECC and their proposed future use as limited storage/access areas.

REMEDIATION APPROACH

The current D&D approach requires that within survey units, areas exceeding the DCGL will require remediation. This remediation will likely include physical removal and processing of contaminated building materials. Where feasible, contaminated building surfaces and materials will be remediated to as low as reasonable achievable (ALARA). The radioactive waste generated during D&D will likely be shipped to an approved commercial waste disposal site. The acceptance of modified DCGLs is critical to the preparation of a site decommissioning plan, which is currently under development.

SITE DESCRIPTION

The setting and nature of the St. Albans VAECC have been described extensively in Weston (1999) and S&W (1998). The primary radionuclide of concern is strontium-90, with minor amounts of removable tritium contamination identified in two survey units. The strontium-90 surface contamination DCGLs as presented in S&W (1998) are 200 dpm/100 cm², 1000 dpm/100 cm² and 3000 dpm/100 cm² for removable, total and maximum surface levels, respectively. The tritium DCGL is 1000 dpm/100 cm² for removable contamination only. The soil/bulk material strontium-90 DCGL is 5 pCi/g.

Areas exceeding the current VAECC Work Plan DCGLs have been noted within Survey Units 001 through 004 and Survey Unit 009. Strontium-90 has been identified in Survey Units 001, 002, and 004, while tritium has been identified in Survey Units 003 and 009. Table 1 presents a summary of the surface contamination levels (attributable to strontium-90) identified in the survey units (Weston 1999).

Table 1. Total and Removable Strontium-90 Surface Contamination Data.

Survey Unit	Description	Total Beta-Gamma		Removable Beta-Gamma	
		Range (dpm/100 cm ²)	Average	Range (dpm/100 cm ²)	Average
001	Nuclear Medicine Lab	-250 to 2.8 E6	1.1 E5	-4 to 2.7 E3	2.7E2
002	Ejector Pit	67 to 7.5 E3	3.2 E3	11 to 76	36
003	Ladies Toilet	2.8 E2 to 8.7 E2	6.8 E2	-44 to 22	-13
004	Men's Toilet	-67 to 1.5 E5	3.0 E4	-4 to 83	36
009	Incinerator	-3.4 E2 to 8.9 E2	2.7 E2	-22 to 43	14

Table 2 presents a summary of the removable surface contamination levels attributable to tritium identified in the survey units (Weston 1999). No total tritium contamination measurements were attempted, and for assessment purposes it is assumed that all tritium activity is removable.

Table 2. Removable Tritium Surface Contamination Summary Data.

Survey Unit	Description	Removable Tritium	
		Range (dpm/100 cm ²)	Average
001	Nuclear Medicine Lab	-22 to 1.7 E3	320
002	Ejector Pit	-7 to 59	10
003	Ladies Toilet	-43 to 2.5 E4	3.5 E3
004	Men's Toilet	-25 to 7.5 E2	95
009	Incinerator	-3.6 E2 to 2.9 E3	-54

DEVELOPMENT OF MODIFIED SURFACE CONTAMINATION DCGLs

Release of Equipment and Material – The proposed DCGLs for unrestricted release of equipment and material from the facility are 200 dpm/100 cm², 1000 dpm/100 cm² and 3000 dpm/100 cm² for removable, total and maximum surface levels, respectively. The tritium DCGL is 1000 dpm/100 cm² for removable contamination only. These DCGLs are identical to values presented to the VA ECC Work Plan and may be referenced to NRC (1993).

Building Surfaces - Based on application of the DandD code, NRC (1998a) presented generic screening values for building surface contamination for beta-gamma emitting radionuclides. The applicable values as taken from this document are 1.2 E8 dpm/100 cm² and 8,700 dpm/100 cm²

for tritium and strontium-90, respectively. The screening levels are based on the assumption that the fraction of removable contamination is equal to 0.1 (10%). In the presence of multiple beta-gamma emitting radionuclides, a "sum of the fractions approach" must be applied. For a survey unit containing only strontium-90, the screening value of 8700 dpm/100 cm² allows 870 dpm/100 cm² attributable to removable contamination. Based on actual site data, should the removable surface contamination fraction exceed 0.1 or be undetermined, the screening levels should be decreased by a factor of 10 (NRC 1998a).

Based on characterization survey data (Weston, 1999), Table 3 presents the ratio of removable to total surface contamination in each of the five survey units of interest at the VA ECC. Ratios are derived for the high and average pair of removable/total surface contamination values for each set of characterization data as extracted from Table 1. It can be seen in Table 3 that all of the calculated ratios are significantly less than 0.1. The interpretation of this observation is that relatively little of the contamination noted in the VA ECC survey units is removable. Subsequently, applying generic screening criteria that assume a fraction of 0.1 should be considered extremely conservative because calculated doses from internal exposure pathways would be significantly less.

Table 3. Removable/Total Contamination Ratios.

Survey Unit	High Removable/High Total Value	Average Removable/Average Total Value
001	0.001	0.002
002	0.010	0.011
003	0.025	-0.019
004	0.001	0.001
009	0.048	0.052

No application of the sum of the fractions rule is presented, as each of the subject survey units have been identified as having elevated strontium-90 or tritium levels, but not both.

DEVELOPMENT OF SOIL DCGL FOR STRONTIUM-90

Dose limits as presented in 10 CFR 20 Subpart E, are such that for unrestricted release, a licensee must demonstrate that the future total effective dose equivalent (TEDE) to site residents,

visitors or workers is less than 25 mrem per year. The TEDE is calculated through the application of surface contamination levels and bulk material radionuclide concentrations to exposure pathways applicable to the site.

A variety of methods to calculate the TEDE have been discussed in the development of NRC implementation guidance related to 10 CFR 20 Subpart E. Draft NRC Regulatory Guide DG-4006 discusses acceptable modeling approaches to use generic screening to develop DCGLs. Per DG-4006, Volume I of NUREG/CR-5512 provides acceptable generic scenarios that may be used in dose screening. Volume III of NUREG/CR-5512 includes the DandD modeling code, which may be applied to the default scenario and input parameters. The application of site-specific parameter values and alternate models is discussed in Draft NUREG-1549 (NRC 1998).

It should be noted that limited soil contamination has been noted near some drain lines and in some soil beneath and near the former nuclear medicine laboratory (Survey Unit 001). Characterization results indicate that this contamination does not exceed 6" depth in most locations. The maximum strontium-90 concentration identified during characterization was 2200 pCi/g. Due to the limited area and volume that has been impacted, a significant future dose contribution was not anticipated.

Application of the RESRAD Code, Version 5.82 (ANL 1998) was performed to determine the strontium-90 soil concentration that would yield a TEDE of 25 mrem. The source input parameters were set for a contaminated area of 90 m² with a depth of 0.15 m. In applying the code, the meat ingestion, milk ingestion, aquatic foods ingestion and radon exposure pathways were excluded from the analysis. The plant ingestion scenario was included, but is postulated to be highly unlikely due to the limited agricultural land use in the St. Albans/Queens metropolitan New York area. Likewise, the groundwater pathway was included, but may not be entirely applicable, as the drinking water source for Queens has been in transition from groundwater to surface water sources provided from upstate New York.

The only code defaults modified included the erosion rate and distance to drinking water aquifer. Given the vegetation/rainfall for the area, the erosion rate was modified from 0.001 to 0.00001 meter per year. Given the relatively short half-life of strontium-90 (negligible activity after 200

years), this change is somewhat trivial. The distance to the drinking water aquifer was modified from 100 meters to 10 meters. Default parameters for each of the scenarios may be found with the modeling outputs contained in Attachment 1.

Using iterative values for the input strontium-90 concentration, it was determined that a value of 345 pCi/g would yield a TEDE of 25 mrem per year under the stated exposure scenario. As would be expected under the scenario, the maximum dose is received at time t=0, and decreases relative to the decay rate of strontium-90. The relatively high concentration resulting in a 25 mrem/year dose is linked to the very small source area/volume and exposure pathway nature.

CONCLUSION

Based on the information contained herein, it is recommended that the tritium and strontium-90 generic screening levels as presented in NRC (1998a) be applied as surface contamination DCGLs for building surfaces left in place at the VAECC. Likewise, the strontium-90 soil DCGL should be modified to 345 pCi/g. In all cases, D&D efforts will be performed to reduce surface contamination levels and bulk material concentration to as low as reasonably achievable (ALARA). Table 4 summarizes all proposed modified DCGLs for the D&D operations.

Table 4. Proposed Modified DCGLs.

Isotope	Equipment and Material Release DCGL Total (dpm/100cm ²)	Equipment and Material Release DCGL Removable (dpm/100cm ²)	Equipment and Material Release DCGL Maximum (dpm/100cm ²)	Building Surface Contamination DCGL ¹ (dpm/100cm ²)	Soil Contamination Limit (pCi/g)
Tritium	--	1000		1.2 x 10 ⁸	---
Sr-90	1000	200	3000	8.7 x 10 ³	345

¹Removable contamination levels not to exceed 10% of value.

Application of these DCGLs would indicate that significant D&D activities will be required in Survey Units 001 and 004. Limited or no D&D may be required in Survey Units 002, 003 and 009, however additional survey data may be collected to meet the requirements of a final status survey (MARSSIM).

REFERENCES

- ANL 1998. RESRAD Version 5.82. Argonne National Laboratory. April 1998.
- NRC 1998. Guidance on Using Decision Methods for Dose Assessment to Comply with Radiological Criteria for License Termination. U.S. Nuclear Regulatory Commission Draft NUREG-1549, March 1998.
- NRC 1998a. Supplemental Information on the Implementation of the Final Rule on Radiological Criteria for License Termination. Federal Register Notice FR18NO98-121, November 21, 1998.
- NRC 1998b. Guidelines for the Decommissioning of Facilities and Equipment Prior to Release for Unrestricted Use or Termination of Byproduct, Source, or Special Nuclear Material Licenses. Policy and Guidance Directive FC83-23.
- S&W 1998. Draft Final Work Plan for the Radiological Characterization Survey of the St. Albans Veterans Extended Care Center Queens, New York. Prepared for the Department of Army, New England District, Corps of Engineers by Stone and Webster Environmental Technology and Services, Boston, Massachusetts. September 1998.
- Weston 1999. Radiological Characterization Survey Report – St. Albans Veterans Administration Extended Care Center, Queens, New York. Weston report prepared under Task Order 19, Contract DACA31-96-D-0006. April 1999.

ATTACHMENT 1

Dose Conversion Factor (and Related) Parameter Summary
 File: DOSFAC.BIN

Menu	Parameter	Current Value	Parameter Default	Parameter Name
AA				
B-1	Dose conversion factors for inhalation, mrem/pCi:			
B-1	Sr-90+D	1.310E-03	1.310E-03	DCF2(1)
D-1	Dose conversion factors for ingestion, mrem/pCi:			
D-1	Sr-90+D	1.530E-04	1.530E-04	DCF3(1)
D-34	Food transfer factors:			
D-34	Sr-90+D , plant/soil concentration ratio, dimensionless	3.000E-01	3.000E-01	RTF(1,1)
D-34	Sr-90+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	8.000E-03	8.000E-03	RTF(1,2)
D-34	Sr-90+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	2.000E-03	2.000E-03	RTF(1,3)
D-5	Bioaccumulation factors, fresh water, L/kg:			
D-5	Sr-90+D , fish	6.000E+01	6.000E+01	BIOFAC(1,1)
D-5	Sr-90+D , crustacea and mollusks	1.000E+02	1.000E+02	BIOFAC(1,2)

Site-Specific Parameter Summary

Menu	Parameter	User Input	Used by RESRAD Default	(If different from user input)	Parameter Name
AA					
<input type="checkbox"/>	R011 Area of contaminated zone (m**2)	✓ 9.000E+01	1.000E+04	---	AREA
<input type="checkbox"/>	R011 Thickness of contaminated zone (m)	✓ 1.500E-01	2.000E+00	---	THICKO
<input type="checkbox"/>	R011 Length parallel to aquifer flow (m)	1.000E+01	1.000E+02	---	LCZPAQ
<input type="checkbox"/>	R011 Basic radiation dose limit (mrem/yr)	3.000E+01	3.000E+01	---	BRDL
<input type="checkbox"/>	R011 Time since placement of material (yr)	0.000E+00	0.000E+00	---	TI
<input type="checkbox"/>	R011 Times for calculations (yr)	✓ 1.000E+00	1.000E+00	---	T (2)
<input type="checkbox"/>	R011 Times for calculations (yr)	✓ 3.000E+00	3.000E+00	---	T (3)
<input type="checkbox"/>	R011 Times for calculations (yr)	✓ 1.000E+01	1.000E+01	---	T (4)
<input type="checkbox"/>	R011 Times for calculations (yr)	✓ 3.000E+01	3.000E+01	---	T (5)
<input type="checkbox"/>	R011 Times for calculations (yr)	✓ 1.000E+02	1.000E+02	---	T (6)
<input type="checkbox"/>	R011 Times for calculations (yr)	✓ 3.000E+02	3.000E+02	---	T (7)
<input type="checkbox"/>	R011 Times for calculations (yr)	✓ 1.000E+03	1.000E+03	---	T (8)
<input type="checkbox"/>	R011 Times for calculations (yr)	not used	0.000E+00	---	T (9)
<input type="checkbox"/>	R011 Times for calculations (yr)	not used	0.000E+00	---	T (10)
<input checked="" type="checkbox"/>	R012 Initial principal radionuclide (pCi/g): Sr-90	✓ 3.450E+02	0.000E+00	---	S1 (1)
<input type="checkbox"/>	R012 Concentration in groundwater (pCi/L): Sr-90	not used	0.000E+00	---	W1 (1)
<input checked="" type="checkbox"/>	R013 Cover depth (m)	✓ 0.000E+00	0.000E+00	---	COVERO
<input type="checkbox"/>	R013 Density of cover material (g/cm**3)	not used	1.500E+00	---	DENSCV
<input type="checkbox"/>	R013 Cover depth erosion rate (m/yr)	not used	1.000E-03	---	VCV
<input type="checkbox"/>	R013 Density of contaminated zone (g/cm**3)	✓ 1.500E+00	1.500E+00	---	DENSCZ
<input type="checkbox"/>	R013 Contaminated zone erosion rate (m/yr)	✓ 1.000E-05	1.000E-03	---	VCZ
<input type="checkbox"/>	R013 Contaminated zone total porosity	✓ 4.000E-01	4.000E-01	---	TPCZ
<input type="checkbox"/>	R013 Contaminated zone effective porosity	✓ 2.000E-01	2.000E-01	---	EPCZ
<input type="checkbox"/>	R013 Contaminated zone hydraulic conductivity (m/yr)	✓ 1.000E+01	1.000E+01	---	HCCZ
<input type="checkbox"/>	R013 Contaminated zone b parameter	✓ 5.300E+00	5.300E+00	---	BCZ
<input type="checkbox"/>	R013 Average annual wind speed (m/sec)	✓ 2.000E+00	2.000E+00	---	WIND
<input type="checkbox"/>	R013 Humidity in air (g/m**3)	not used	8.000E+00	---	HUMID
<input type="checkbox"/>	R013 Evapotranspiration coefficient	✓ 5.000E-01	5.000E-01	---	EVAPTR
<input type="checkbox"/>	R013 Precipitation (m/yr)	✓ 1.000E+00	1.000E+00	---	PRECIP
<input type="checkbox"/>	R013 Irrigation (m/yr)	✓ 2.000E-01	2.000E-01	---	RI
<input type="checkbox"/>	R013 Irrigation mode	✓ overhead	overhead	---	IDITCH
<input type="checkbox"/>	R013 Runoff coefficient	✓ 2.000E-01	2.000E-01	---	RUNOFF
<input type="checkbox"/>	R013 Watershed area for nearby stream or pond (m**2)	✓ 1.000E+06	1.000E+06	---	WAREA
<input type="checkbox"/>	R013 Accuracy for water/soil computations	✓ 1.000E-03	1.000E-03	---	EPS
<input type="checkbox"/>	R014 Density of saturated zone (g/cm**3)	✓ 1.500E+00	1.500E+00	---	DENSAQ
<input type="checkbox"/>	R014 Saturated zone total porosity	✓ 4.000E-01	4.000E-01	---	TPSZ
<input type="checkbox"/>	R014 Saturated zone effective porosity	✓ 2.000E-01	2.000E-01	---	EPSZ
<input type="checkbox"/>	R014 Saturated zone hydraulic conductivity (m/yr)	✓ 1.000E+02	1.000E+02	---	HCSZ
<input type="checkbox"/>	R014 Saturated zone hydraulic gradient	2.000E-02	2.000E-02	---	HGWT
<input type="checkbox"/>	R014 Saturated zone b parameter	✓ 5.300E+00	5.300E+00	---	BSZ
<input type="checkbox"/>	R014 Water table drop rate (m/yr)	✓ 1.000E-03	1.000E-03	---	VWT
<input type="checkbox"/>	R014 Well pump intake depth (m below water table)	✓ 1.000E+01	1.000E+01	---	DWIBWT
<input type="checkbox"/>	R014 Model: Nondispersion (ND) or Mass-Balance (MB)	✓ ND	ND	---	MODEL
<input type="checkbox"/>	R014 Well pumping rate (m**3/yr)	✓ 2.500E+02	2.500E+02	---	UW
<input type="checkbox"/>	R015 Number of unsaturated zone strata	✓ 1	1	---	NS

Site-Specific Parameter Summary (continued)

Menu	Parameter	User Input	Used by RESRAD Default	(If different from user input)	Parameter Name
R015	Unsat. zone 1, thickness (m)	4.000E+00	4.000E+00	---	H(1)
R015	Unsat. zone 1, soil density (g/cm**3)	1.500E+00	1.500E+00	---	DENSUZ(1)
R015	Unsat. zone 1, total porosity	4.000E-01	4.000E-01	---	TPUZ(1)
R015	Unsat. zone 1, effective porosity	2.000E-01	2.000E-01	---	EPUZ(1)
R015	Unsat. zone 1, soil-specific b parameter	5.300E+00	5.300E+00	---	BUZ(1)
R015	Unsat. zone 1, hydraulic conductivity (m/yr)	1.000E+01	1.000E+01	---	HCUZ(1)
R016	Distribution coefficients for Sr-90				
R016	Contaminated zone (cm**3/g)	3.000E+01	3.000E+01	---	DCNUCC(1)
R016	Unsaturated zone 1 (cm**3/g)	3.000E+01	3.000E+01	---	DCNUCU(1,1)
R016	Saturated zone (cm**3/g)	3.000E+01	3.000E+01	---	DCNUCS(1)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	7.355E-02	ALEACH(1)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(1)
R017	Inhalation rate (m**3/yr)	8.400E+03	8.400E+03	---	INHALR
R017	Mass loading for inhalation (g/m**3)	1.000E-04	1.000E-04	---	MLINH
R017	Exposure duration	3.000E+01	3.000E+01	---	ED
R017	Shielding factor, inhalation	4.000E-01	4.000E-01	---	SHF3
R017	Shielding factor, external gamma	7.000E-01	7.000E-01	---	SHF1
R017	Fraction of time spent indoors	5.000E-01	5.000E-01	---	FIND
R017	Fraction of time spent outdoors (on site)	2.500E-01	2.500E-01	---	FOTD
R017	Shape factor flag, external gamma	1.000E+00	1.000E+00	>0 shows circular AREA.	FS
R017	Radii of shape factor array (used if FS = -1):				
R017	Outer annular radius (m), ring 1:	not used	5.000E+01	---	RAD_SHAPE(1)
R017	Outer annular radius (m), ring 2:	not used	7.071E+01	---	RAD_SHAPE(2)
R017	Outer annular radius (m), ring 3:	not used	0.000E+00	---	RAD_SHAPE(3)
R017	Outer annular radius (m), ring 4:	not used	0.000E+00	---	RAD_SHAPE(4)
R017	Outer annular radius (m), ring 5:	not used	0.000E+00	---	RAD_SHAPE(5)
R017	Outer annular radius (m), ring 6:	not used	0.000E+00	---	RAD_SHAPE(6)
R017	Outer annular radius (m), ring 7:	not used	0.000E+00	---	RAD_SHAPE(7)
R017	Outer annular radius (m), ring 8:	not used	0.000E+00	---	RAD_SHAPE(8)
R017	Outer annular radius (m), ring 9:	not used	0.000E+00	---	RAD_SHAPE(9)
R017	Outer annular radius (m), ring 10:	not used	0.000E+00	---	RAD_SHAPE(10)
R017	Outer annular radius (m), ring 11:	not used	0.000E+00	---	RAD_SHAPE(11)
R017	Outer annular radius (m), ring 12:	not used	0.000E+00	---	RAD_SHAPE(12)
R017	Fractions of annular areas within AREA:				
R017	Ring 1	not used	1.000E+00	---	FRACA(1)
R017	Ring 2	not used	2.732E-01	---	FRACA(2)
R017	Ring 3	not used	0.000E+00	---	FRACA(3)
R017	Ring 4	not used	0.000E+00	---	FRACA(4)
R017	Ring 5	not used	0.000E+00	---	FRACA(5)
R017	Ring 6	not used	0.000E+00	---	FRACA(6)
R017	Ring 7	not used	0.000E+00	---	FRACA(7)
R017	Ring 8	not used	0.000E+00	---	FRACA(8)
R017	Ring 9	not used	0.000E+00	---	FRACA(9)
R017	Ring 10	not used	0.000E+00	---	FRACA(10)
R017	Ring 11	not used	0.000E+00	---	FRACA(11)
R017	Ring 12	not used	0.000E+00	---	FRACA(12)
R018	Fruits, vegetables and grain consumption (kg/yr)	1.600E+02	1.600E+02	---	DIET(1)

Site-Specific Parameter Summary (continued)

Menu	Parameter	User Input	Used by RESRAD Default	(If different from user input)	Parameter Name
R018	Leafy vegetable consumption (kg/yr)	1.400E+01	1.400E+01	---	DIET(2)
R018	Milk consumption (L/yr)	not used	9.200E+01	---	DIET(3)
R018	Meat and poultry consumption (kg/yr)	not used	6.300E+01	---	DIET(4)
R018	Fish consumption (kg/yr)	not used	5.400E+00	---	DIET(5)
R018	Other seafood consumption (kg/yr)	not used	9.000E-01	---	DIET(6)
R018	Soil ingestion rate (g/yr)	3.650E+01	3.650E+01	---	SOIL
R018	Drinking water intake (L/yr)	5.100E+02	5.100E+02	---	DWI
R018	Contamination fraction of drinking water	1.000E+00	1.000E+00	---	FDW
R018	Contamination fraction of household water	not used	1.000E+00	---	FHHW
R018	Contamination fraction of livestock water	not used	1.000E+00	---	FLW
R018	Contamination fraction of irrigation water	1.000E+00	1.000E+00	---	FIRW
R018	Contamination fraction of aquatic food	not used	5.000E-01	---	FR9
R018	Contamination fraction of plant food	-1	-1	0.450E-01	FPLANT
R018	Contamination fraction of meat	not used	-1	---	FMEAT
R018	Contamination fraction of milk	not used	-1	---	FMILK
R019	Livestock fodder intake for meat (kg/day)	not used	6.800E+01	---	LF15
R019	Livestock fodder intake for milk (kg/day)	not used	5.500E+01	---	LF16
R019	Livestock water intake for meat (L/day)	not used	5.000E+01	---	LW15
R019	Livestock water intake for milk (L/day)	not used	1.600E+02	---	LW16
R019	Livestock soil intake (kg/day)	not used	5.000E-01	---	LSI
R019	Mass loading for foliar deposition (g/m**3)	1.000E-04	1.000E-04	---	MLFD
R019	Depth of soil mixing layer (m)	1.500E-01	1.500E-01	---	DM
R019	Depth of roots (m)	9.000E-01	9.000E-01	---	DROOT
R019	Drinking water fraction from ground water	1.000E+00	1.000E+00	---	FGWDW
R019	Household water fraction from ground water	1.000E+00	1.000E+00	---	FGWHH
R019	Livestock water fraction from ground water	not used	1.000E+00	---	FGWLW
R019	Irrigation fraction from ground water	not used	1.000E+00	---	FGWIR
R19B	Wet weight crop yield for Non-Leafy (kg/m**2)	7.000E-01	7.000E-01	---	YV(1)
R19B	Wet weight crop yield for Leafy (kg/m**2)	1.500E+00	1.500E+00	---	YV(2)
R19B	Wet weight crop yield for Fodder (kg/m**2)	not used	1.100E+00	---	YV(3)
R19B	Growing Season for Non-Leafy (years)	1.700E-01	1.700E-01	---	TE(1)
R19B	Growing Season for Leafy (years)	2.500E-01	2.500E-01	---	TE(2)
R19B	Growing Season for Fodder (years)	not used	8.000E-02	---	TE(3)
R19B	Translocation Factor for Non-Leafy	1.000E-01	1.000E-01	---	TIV(1)
R19B	Translocation Factor for Leafy	1.000E+00	1.000E+00	---	TIV(2)
R19B	Translocation Factor for Fodder	not used	1.000E+00	---	TIV(3)
R19B	Dry Foliar Interception Fraction for Non-Leafy	2.500E-01	2.500E-01	---	RDRY(1)
R19B	Dry Foliar Interception Fraction for Leafy	2.500E-01	2.500E-01	---	RDRY(2)
R19B	Dry Foliar Interception Fraction for Fodder	not used	2.500E-01	---	RDRY(3)
R19B	Wet Foliar Interception Fraction for Non-Leafy	2.500E-01	2.500E-01	---	RWET(1)
R19B	Wet Foliar Interception Fraction for Leafy	2.500E-01	2.500E-01	---	RWET(2)
R19B	Wet Foliar Interception Fraction for Fodder	not used	2.500E-01	---	RWET(3)
R19B	Weathering Removal Constant for Vegetation	2.000E+01	2.000E+01	---	WLAM
C14	C-12 concentration in water (g/cm**3)	not used	2.000E-05	---	C12WTR
C14	C-12 concentration in contaminated soil (g/g)	not used	3.000E-02	---	C12CZ
C14	Fraction of vegetation carbon from soil	not used	2.000E-02	---	CSOIL
C14	Fraction of vegetation carbon from air	not used	9.800E-01	---	CAIR
C14	C-14 evasion layer thickness in soil (m)	not used	3.000E-01	---	DMC

Site-Specific Parameter Summary (continued)

Menu	Parameter	User Input	Used by RESRAD Default	(If different from user input)	Parameter Name
C14	C-14 evasion flux rate from soil (1/sec)	not used	7.000E-07	---	EVSN
C14	C-12 evasion flux rate from soil (1/sec)	not used	1.000E-10	---	REVSN
C14	Fraction of grain in beef cattle feed	not used	8.000E-01	---	AVFG4
C14	Fraction of grain in milk cow feed	not used	2.000E-01	---	AVFG5
STOR	Storage times of contaminated foodstuffs (days):				
STOR	Fruits, non-leafy vegetables, and grain	1.400E+01	1.400E+01	---	STOR_T(1)
STOR	Leafy vegetables	1.000E+00	1.000E+00	---	STOR_T(2)
STOR	Milk	1.000E+00	1.000E+00	---	STOR_T(3)
STOR	Meat and poultry	2.000E+01	2.000E+01	---	STOR_T(4)
STOR	Fish	7.000E+00	7.000E+00	---	STOR_T(5)
STOR	Crustacea and mollusks	7.000E+00	7.000E+00	---	STOR_T(6)
STOR	Well water	1.000E+00	1.000E+00	---	STOR_T(7)
STOR	Surface water	1.000E+00	1.000E+00	---	STOR_T(8)
STOR	Livestock fodder	4.500E+01	4.500E+01	---	STOR_T(9)
R021	Thickness of building foundation (m)	not used	1.500E-01	---	FLOOR
R021	Bulk density of building foundation (g/cm ³)	not used	2.400E+00	---	DENSFL
R021	Total porosity of the cover material	not used	4.000E-01	---	TPCV
R021	Total porosity of the building foundation	not used	1.000E-01	---	TPFL
R021	Volumetric water content of the cover material	not used	5.000E-02	---	PH2OCV
R021	Volumetric water content of the foundation	not used	3.000E-02	---	PH2OFL
R021	Diffusion coefficient for radon gas (m/sec):				
R021	in cover material	not used	2.000E-06	---	DIFCV
R021	in foundation material	not used	3.000E-07	---	DIFFL
R021	in contaminated zone soil	not used	2.000E-06	---	DIFCZ
R021	Radon vertical dimension of mixing (m)	not used	2.000E+00	---	HMIX
R021	Average building air exchange rate (1/hr)	not used	5.000E-01	---	REXG
R021	Height of the building (room) (m)	not used	2.500E+00	---	HRM
R021	Building interior area factor	not used	0.000E+00	---	FAI
R021	Building depth below ground surface (m)	not used	-1.000E+00	---	DMFL
R021	Emanating power of Rn-222 gas	not used	2.500E-01	---	EMANA(1)
R021	Emanating power of Rn-220 gas	not used	1.500E-01	---	EMANA(2)

Summary of Pathway Selections

Pathway	User Selection
1 - external gamma	active
2 - inhalation (w/o radon)	active
3 - plant ingestion	active
4 - meat ingestion	suppressed
5 - milk ingestion	suppressed
6 - aquatic foods	suppressed
7 - drinking water	active
8 - soil ingestion	active
9 - radon	suppressed
Find peak pathway doses	suppressed

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
 As mrem/yr and Fraction of Total Dose At t = 0.000E+00 years

Water Independent Pathways (Inhalation excludes radon)

	Ground	Inhalation	Radon	Plant	Meat	Milk	Soil						
Radio-	mrem/yr fract.		mrem/yr fract.		mrem/yr fract.		mrem/yr fract.		mrem/yr fract.		mrem/yr fract.		
Sr-90	4.507E+00	0.1780	1.765E-02	0.0007	0.000E+00	0.0000	2.067E+01	0.8162	0.000E+00	0.0000	0.000E+00	0.0000	1.30
Total	4.507E+00	0.1780	1.765E-02	0.0007	0.000E+00	0.0000	2.067E+01	0.8162	0.000E+00	0.0000	0.000E+00	0.0000	1.30

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
 As mrem/yr and Fraction of Total Dose At t = 0.000E+00 years

Water Dependent Pathways

	Water	Fish	Radon	Plant	Meat	Milk	All Pathways*						
Radio-	mrem/yr fract.		mrem/yr fract.		mrem/yr fract.		mrem/yr fract.		mrem/yr fract.		mrem/yr fract.		
Sr-90	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.5
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.5

*Sum of all water independent and dependent pathways.

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
 As mrem/yr and Fraction of Total Dose At t = 1.000E+00 years

Water Independent Pathways (Inhalation excludes radon)

Radio-	Ground	Inhalation	Radon	Plant	Meat	Milk	Soil	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Sr-90	4.089E+00	0.1776	1.601E-02	0.0007	0.000E+00	0.0000	1.880E+01	0.8166
Total	4.089E+00	0.1776	1.601E-02	0.0007	0.000E+00	0.0000	1.880E+01	0.8166

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
 As mrem/yr and Fraction of Total Dose At t = 1.000E+00 years

Water Dependent Pathways

Radio-	Water	Fish	Radon	Plant	Meat	Milk	All Pathways*	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Sr-90	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000

*Sum of all water independent and dependent pathways.

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
 As mrem/yr and Fraction of Total Dose At t = 3.000E+00 years

Water Independent Pathways (Inhalation excludes radon)

Radio-	Ground	Inhalation	Radon	Plant	Meat	Milk	Soil						
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr
Sr-90	3.365E+00	0.1776	1.318E-02	0.0007	0.000E+00	0.0000	1.547E+01	0.8165	0.000E+00	0.0000	0.000E+00	0.0000	9.7
Total	3.365E+00	0.1776	1.318E-02	0.0007	0.000E+00	0.0000	1.547E+01	0.8165	0.000E+00	0.0000	0.000E+00	0.0000	9.7

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
 As mrem/yr and Fraction of Total Dose At t = 3.000E+00 years

Water Dependent Pathways

Radio-	Water	Fish	Radon	Plant	Meat	Milk	All Pathways*						
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr
Sr-90	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1

*Sum of all water independent and dependent pathways.

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
 As mrem/yr and Fraction of Total Dose At t = 1.000E+01 years

Water Independent Pathways (Inhalation excludes radon)

	Ground	Inhalation	Radon	Plant	Meat	Milk	Soil	
Radio-	AAAAAAAAAAAAAAAA	AAAAAAAAAAAAAAAA	AAAAAAAAAAAAAAAA	AAAAAAAAAAAAAAAA	AAAAAAAAAAAAAAAA	AAAAAAAAAAAAAAAA	AAAAAAAAAAAAAAAA	AAAAAAAAAAAAAAAA
Nuclide	mrem/yr	mrem/yr	mrem/yr	mrem/yr	mrem/yr	mrem/yr	mrem/yr	mrem/yr
	fract.	fract.	fract.	fract.	fract.	fract.	fract.	fract.
Sr-90	1.702E+00	0.1777	6.663E-03	0.0007	0.000E+00	0.0000	7.822E+00	0.8165
	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Total	1.702E+00	0.1777	6.663E-03	0.0007	0.000E+00	0.0000	7.822E+00	0.8165
	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
	4.9							

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
 As mrem/yr and Fraction of Total Dose At t = 1.000E+01 years

Water Dependent Pathways

	Water	Fish	Radon	Plant	Meat	Milk	All Pathways*	
Radio-	AAAAAAAAAAAAAAAA	AAAAAAAAAAAAAAAA	AAAAAAAAAAAAAAAA	AAAAAAAAAAAAAAAA	AAAAAAAAAAAAAAAA	AAAAAAAAAAAAAAAA	AAAAAAAAAAAAAAAA	AAAAAAAAAAAAAAAA
Nuclide	mrem/yr	mrem/yr	mrem/yr	mrem/yr	mrem/yr	mrem/yr	mrem/yr	mrem/yr
	fract.	fract.	fract.	fract.	fract.	fract.	fract.	fract.
Sr-90	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
	0.0000	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
	0.0000	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
	9.5							

*Sum of all water independent and dependent pathways.

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
 As mrem/yr and Fraction of Total Dose At t = 3.000E+01 years

Water Independent Pathways (Inhalation excludes radon)

Radio-	Ground	Inhalation	Radon	Plant	Meat	Milk	Soil					
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Sr-90	2.428E-01	0.1779	9.495E-04	0.0007	0.000E+00	0.0000	1.115E+00	0.8163	0.000E+00	0.0000	0.000E+00	0.0000
Total	2.428E-01	0.1779	9.495E-04	0.0007	0.000E+00	0.0000	1.115E+00	0.8163	0.000E+00	0.0000	0.000E+00	0.0000

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
 As mrem/yr and Fraction of Total Dose At t = 3.000E+01 years

Water Dependent Pathways

Radio-	Water	Fish	Radon	Plant	Meat	Milk	All Pathways*					
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Sr-90	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000

*Sum of all water independent and dependent pathways.

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
 As mrem/yr and Fraction of Total Dose At t = 1.000E+02 years

Water Independent Pathways (Inhalation excludes radon)

	Ground	Inhalation	Radon	Plant	Meat	Milk	Soil						
Radio-	AAAAA	AAAAA	AAAAA	AAAAA	AAAAA	AAAAA	AAAAA	AAAAA	AAAAA	AAAAA	AAAAA	AAAAA	AAAAA
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr
Sr-90	2.663E-04	0.1784	1.037E-06	0.0007	0.000E+00	0.0000	1.218E-03	0.8158	0.000E+00	0.0000	0.000E+00	0.0000	0.0000
Total	2.663E-04	0.1784	1.037E-06	0.0007	0.000E+00	0.0000	1.218E-03	0.8158	0.000E+00	0.0000	0.000E+00	0.0000	7.64

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
 As mrem/yr and Fraction of Total Dose At t = 1.000E+02 years

Water Dependent Pathways

	Water	Fish	Radon	Plant	Meat	Milk	All Pathways*						
Radio-	AAAAA	AAAAA	AAAAA	AAAAA	AAAAA	AAAAA	AAAAA	AAAAA	AAAAA	AAAAA	AAAAA	AAAAA	AAAAA
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr
Sr-90	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.

*Sum of all water independent and dependent pathways.

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
 As mrem/yr and Fraction of Total Dose At t = 3.000E+02 years

Water Independent Pathways (Inhalation excludes radon)

	Ground	Inhalation	Radon	Plant	Meat	Milk	Soil	
Radio-	AAAAAAAAAAAAAAAA	AAAAAAAAAAAAAAAA	AAAAAAAAAAAAAAAA	AAAAAAAAAAAAAAAA	AAAAAAAAAAAAAAAA	AAAAAAAAAAAAAAAA	AAAAAAAAAAAAAAAA	AAAAAAAAAAAAAAAA
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Sr-90	9.298E-13	0.0000	3.582E-15	0.0000	0.000E+00	0.0000	4.204E-12	0.0000
	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Total	9.298E-13	0.0000	3.582E-15	0.0000	0.000E+00	0.0000	4.204E-12	0.0000

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
 As mrem/yr and Fraction of Total Dose At t = 3.000E+02 years

Water Dependent Pathways

	Water	Fish	Radon	Plant	Meat	Milk	All Pathways*	
Radio-	AAAAAAAAAAAAAAAA	AAAAAAAAAAAAAAAA	AAAAAAAAAAAAAAAA	AAAAAAAAAAAAAAAA	AAAAAAAAAAAAAAAA	AAAAAAAAAAAAAAAA	AAAAAAAAAAAAAAAA	AAAAAAAAAAAAAAAA
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Sr-90	1.520E-02	0.9926	0.000E+00	0.0000	0.000E+00	0.0000	1.133E-04	0.0074
	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Total	1.520E-02	0.9926	0.000E+00	0.0000	0.000E+00	0.0000	1.133E-04	0.0074

*Sum of all water independent and dependent pathways.

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
 As mrem/yr and Fraction of Total Dose At t = 1.000E+03 years

Water Independent Pathways (Inhalation excludes radon)

	Ground	Inhalation	Radon	Plant	Meat	Milk	Soil							
Radio-	AAAAAAAAAAAAAAAA		AAAAAAAAAAAAAAAA		AAAAAAAAAAAAAAAA		AAAAAAAAAAAAAAAA		AAAAAAAAAAAAAAAA		AAAAAAAAAAAAAAAA			
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Sr-90	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
 As mrem/yr and Fraction of Total Dose At t = 1.000E+03 years

Water Dependent Pathways

	Water	Fish	Radon	Plant	Meat	Milk	All Pathways*							
Radio-	AAAAAAAAAAAAAAAA		AAAAAAAAAAAAAAAA		AAAAAAAAAAAAAAAA		AAAAAAAAAAAAAAAA		AAAAAAAAAAAAAAAA		AAAAAAAAAAAAAAAA			
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Sr-90	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000

*Sum of all water independent and dependent pathways.

Dose/Source Ratios Summed Over All Pathways
 Parent and Progeny Principal Radionuclide Contributions Indicated

Parent Product	Branch	DSR(j,t) (mrem/yr)/(pCi/g)									
(i)	(j)	Fraction*	t= 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02	3.000E+02	1.000E+03	
Sr-90	Sr-90	1.000E+00	7.339E-02	6.672E-02	5.491E-02	2.777E-02	3.958E-03	4.326E-06	4.437E-05	2.048E-33	

*Branch Fraction is the cumulative factor for the j't principal radionuclide daughter: CUMBRF(j) = BRF(1)*BRF(2)* ... BRF(j).
 The DSR includes contributions from associated (half-life > 0.5 yr) daughters.

Single Radionuclide Soil Guidelines G(i,t) in pCi/g
 Basic Radiation Dose Limit = 30 mrem/yr

Nuclide	(i)	t= 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02	3.000E+02	1.000E+03	
Sr-90		4.088E+02	4.496E+02	5.463E+02	1.080E+03	7.580E+03	6.934E+06	6.761E+05	*1.365E+14	

*At specific activity limit

Summed Dose/Source Ratios DSR(i,t) in (mrem/yr)/(pCi/g)
 and Single Radionuclide Soil Guidelines G(i,t) in pCi/g
 at t_{min} = time of minimum single radionuclide soil guideline
 and at t_{max} = time of maximum total dose = 0.000E+00 years

Nuclide	Initial	t _{min}	DSR(i,t _{min})	G(i,t _{min})	DSR(i,t _{max})	G(i,t _{max})
(i)	pCi/g	(years)	(pCi/g)	(pCi/g)	(pCi/g)	(pCi/g)
Sr-90	3.450E+02	0.000E+00	7.339E-02	4.088E+02	7.339E-02	4.088E+02

Individual Nuclide Dose Summed Over All Pathways
 Parent Nuclide and Branch Fraction Indicated

Nuclide	Parent	BRF(i)	t=	0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02	3.000E+02	1.000E+03
Sr-90	Sr-90	1.000E+00	2.532E+01	2.302E+01	1.894E+01	9.580E+00	1.365E+00	1.493E-03	1.531E-02	0.000E+00	

BRF(i) is the branch fraction of the parent nuclide.

Individual Nuclide Soil Concentration
 Parent Nuclide and Branch Fraction Indicated

Nuclide	Parent	BRF(i)	S(j,t), pCi/g	0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02	3.000E+02	1.000E+03
Sr-90	Sr-90	1.000E+00	3.450E+02	3.130E+02	2.576E+02	1.303E+02	1.860E+01	2.041E-02	7.143E-11	1.813E-40	

BRF(i) is the branch fraction of the parent nuclide.